Roll No. ..... Total Pages : 03

BT-I/D-21 **41045**

SEMICONDUCTOR PHYSICS

BS-115A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit.

Unit I

1. (a) Explain various types of crystal system with example. 7

(b) What is Frenkel Defect ? Derive the expression to show that Frenkel defect in ionic cyrstal depends on temperature. **8**

2. (a) Discuss the nature of bonds in Na and water. 7

(b) Explain two-dimensional and three-dimensional Bravais lattice. **8**

Unit II

3. (a) Why there is need and origin of quantum mechanics and also explain its basic postulates. 7

(b) Derive the expression for Schrödinger time independent wave equation for a free particle. **8**

4. (a) Explain group velocity and phase velocity. Derive the expression for group velocity with which a wave packet travel. **8**

(b) Explain the non-existence of electron in nucleus using Heisenberg's Uncertainty Principle. 7

Unit III

5. (a) Explain Kronig-Penney model for the motion of an electron in a periodic potential. 7

(b) Discuss briefly the following :

(i) E-K diagram

(ii) Density of states. **4×2=8**

6. (a) Obtain the expression for thermal conductivity in metals and hence prove Wiedmann-Franz law. **8**

(b) Based on band theory of solids distinguish between metals, insulators and semiconductor. 7

Unit IV

7. (a) What do you mean by extrinsic semiconductor ? Derive an expression for carrier concentration in extrinsic semiconductor. **8**

(b) Describe the formation of p-n junction. Discuss its current voltage characteristic. 7

8. (a) Discuss in detail metal semiconductor junction. 7

(b) Explain the working and characteristics of Field Effect Transistor (FET). **8**